## CLAIMS

1. A transmitter comprising:

a coding section:

a serial-to-parallel conversion section;

a unitary matrix modulation section;

a split section;

an inverse Fourier transform section; and

a transmitting section,

wherein the coding section receives an input of a transmitting signal and low-density-parity-codes the received signal, and outputs the coded signal;

wherein the serial-to-parallel conversion section converts the output coded signal from serial to parallel, and outputs m ($m \geqq 2$) intermediate signals;

wherein the unitary matrix modulation section modulates the output m intermediate signals to a unitary matrix of m rows and m columns where elements excepting diagonal elements are zero, and outputs an obtained matrix;

wherein the split section supplies each of the diagonal elements of the output matrix to each input channel of the inverse Fourier transform section as an input signal;

wherein the inverse Fourier transform section inversely Fourier transforms the input signals supplied to the input channels, and outputs obtained m inversely Fourier transformed signals;

wherein the parallel-to-serial conversion section converts the output m inversely Fourier transformed signals from parallel to serial, and outputs one transmission signal;

wherein the transmitting section transmits the output transmission signal; and

wherein any of frequency differences between the channels of the inverse Fourier transform section is a predetermined coherent bandwidth or more.

2. A receiver comprising:

a receiving section;

a serial-to-parallel conversion section;

a Fourier transform section;

an inverse split section;

a unitary matrix demodulation section;

a parallel-to-serial conversion section; and

a decoding section,

wherein the receiving section receives a transmitted transmission signal and outputs the signal as a received signal;

wherein the serial-to-parallel conversion section converts the output received signal from serial to parallel, and outputs m ($m \geqq 2$) intermediate signals;

wherein the Fourier transform section Fourier transforms the output m intermediate signals, and outputs obtained m Fourier transformed signals;

wherein the inverse split section supplies the output m Fourier transformed signals to the unitary matrix demodulation section;

wherein the unitary matrix demodulation section demodulates, from matrixes of m rows and m columns where each of the supplied m Fourier transformed signals is a diagonal element and elements excepting the diagonal elements are zero, the signals associated with the unitary matrixes of m rows and m columns where elements excepting diagonal elements are zero, and outputs the signals as demodulated signals;

wherein the parallel-to-serial conversion section converts the plurality of modulated signals from parallel to serial, and outputs the signal as a serialized signal;

wherein the decoding section low-density-parity-codes the output serialized signal, and outputs the signal as a transmitted signal; and

wherein any of frequency differences between channels of the Fourier transform section is a predetermined coherent bandwidth or more.

3. A transmitting method comprising:

a coding step:

a serial-to-parallel conversion step;

a unitary matrix modulation step;

a split step;

an inverse Fourier transform step and

a transmitting step,

wherein in the coding step, an input of a transmitting signal is received and the received signal is low-density-parity-coded, and the coded signal is output;

wherein in the serial-to-parallel conversion step, the output coded signal is converted from serial to parallel, and m ($m \geqq 2$) intermediate signals are output;

wherein in the unitary matrix modulation step, the output m intermediate signals are modulated to a unitary matrix of m rows and m columns where elements excepting diagonal elements are zero, and an obtained matrix is output;

wherein in the split step, each of the diagonal elements of the output matrix is supplied to each input channel of the inverse Fourier transform section as an input signal;

wherein in the inverse Fourier transform step, the input signals supplied to the input channels are inversely Fourier transformed, and obtained m inversely Fourier transformed signals are output;

wherein in the parallel-to-serial conversion step, the output m inversely Fourier transformed signals are converted from parallel to serial, and one transmission signal is output;

wherein in the transmitting step, the output transmission signal is transmitted; and

wherein any of frequency differences between the channels in the inverse Fourier transform step is a predetermined coherent bandwidth or more.

4. A receiving method comprising:

a receiving step;

a serial-to-parallel conversion step;

a Fourier transform step;

an inverse split step;

a unitary matrix demodulation step;

a parallel-to-serial conversion step; and

a decoding step,

wherein in the receiving step, a transmitted transmission signal is received and the signal is output as a received signal;

wherein in the serial-to-parallel conversion step, the output received signal is converted from serial to parallel, and m ($m \geqq 2$) intermediate signals are output;

wherein in the Fourier transform step, the output m intermediate signals are Fourier transformed, and obtained m Fourier transformed signals are output;

wherein in the inverse split step, the output m Fourier transformed signals are supplied to the unitary matrix demodulation step;

wherein in the unitary matrix demodulation step, from matrixes of m rows and m columns where each of the supplied m Fourier transformed signals is a diagonal element and elements excepting the diagonal elements are zero, the signals associated with the unitary matrixes of m rows and m columns where elements excepting diagonal elements are zero are demodulated, and the signals are output as demodulated signals;

wherein in the parallel-to-serial conversion step, the plurality of modulated signals are converted from parallel to serial, and the signal is output as a serialized signal;

wherein in the decoding step, the output serialized signal is low-density-parity-coded, and the signal is output as a transmitted signal; and

wherein any of frequency differences between channels in the Fourier transform step is a predetermined coherent bandwidth or more.

5. A program causing a computer to function a coding section, a serial-to-parallel conversion section, a unitary matrix modulation section, a split section, an inverse Fourier transform section, and a transmitting section,

the program causes the computer to function in such way that:

the coding section receives an input of a transmitting signal and low-density-parity-codes the received signal, and outputs the coded signal;

the serial-to-parallel conversion section converts the output coded signal from serial to parallel, and outputs m ($m \geqq 2$) intermediate signals;

the unitary matrix modulation section modulates the output m intermediate signals to a unitary matrix of m rows and m columns where elements excepting diagonal elements are zero, and outputs an obtained matrix;

the split section supplies each of the diagonal elements of the output matrix to each input channel of the inverse Fourier transform section as an input signal;

the inverse Fourier transform section inversely Fourier transforms the input signals supplied to the input channels, and outputs obtained m inversely Fourier transformed signals;

the parallel-to-serial conversion section converts the output m inversely Fourier transformed signals from parallel to serial, and outputs one transmission signal;

the transmitting section transmits the output transmission signal; and

any of frequency differences between the channels of the inverse Fourier transform section is a predetermined coherent bandwidth or more.

6. A program causing a computer to function a receiving section, a serial-to-parallel conversion section, a Fourier transform section, an inverse split section, a unitary matrix demodulation section, a parallel-to-serial conversion section, and a decoding section,

the program causes the computer to function in such a way that:

the receiving section receives a transmitted transmission signal and outputs the signal as a received signal;

the serial-to-parallel conversion section converts the output received signal from serial to parallel, and outputs m ($m \geqq 2$) intermediate signals;

the Fourier transform section Fourier transforms the output m intermediate signals, and outputs

obtained m Fourier transformed signals;

the inverse split section supplies the output m Fourier transformed signals to the unitary matrix demodulation section;

the unitary matrix demodulation section demodulates, from matrixes of m rows and m columns where each of the supplied m Fourier transformed signals is a diagonal element and elements excepting the diagonal elements are zero, the signals associated with the unitary matrixes of m rows and m columns where elements excepting diagonal elements are zero, and outputs the signals as demodulated signals;

the parallel-to-serial conversion section converts the plurality of modulated signals from parallel to serial, and outputs the signal as a serialized signal;

the decoding section low-density-parity-codes the output serialized signal, and outputs the signal as a transmitted signal; and

any of frequency differences between channels of the Fourier transform section is a predetermined coherent bandwidth or more.

7. A transmitter comprising:

a coding section:

a serial-to-parallel conversion section;

a plurality of unitary matrix modulation sections;

a split section;

an inverse Fourier transform section;

a parallel-to-serial conversion section; and

a transmitting section,

wherein the coding section receives an input of a transmitting signal and low-density-parity-codes the received signal, and outputs the coded signal;

wherein the serial-to-parallel conversion section receives an input of the output coded signal and converts the signal from serial to parallel, and outputs m x n ($m \geqq 2$, $n \geqq 1$) intermediate signals;

wherein each of the plurality of unitary matrix modulation sections modulates the output any m

of intermediate signals of the output m x n ($m \geqq 2$, $n \geqq 1$) intermediate signals without overlaps to a unitary matrix of m rows and m columns where elements excepting diagonal elements are zero, and outputs an obtained matrix;

wherein the split section supplies each of the diagonal elements of the output matrix to each input channel of the inverse Fourier transform section as an input signal;

wherein the inverse Fourier transform section inversely Fourier transforms the input signals supplied to the input channels, and outputs obtained m inversely Fourier transformed signals;

wherein the parallel-to-serial conversion section converts the output m inversely Fourier transformed signals from parallel to serial, and outputs one transmission signal;

wherein the transmitting section transmits the output transmission signal; and

wherein any of frequency differences between the channels to which the diagonal elements of the matrix are given from the plurality of unitary matrix modulation sections is a predetermined coherent bandwidth or more, among the channels of the inverse Fourier transform section.

8. The transmitter according to claim 7, wherein the diagonal elements ($0 \leqq i < n$, $0 \leqq j < m$) of j-th row and j-th column of a matrix output from an ith unitary matrix modulation are given to a $j \times m + i$-th input channel of the inverse Fourier transform section, among the plurality of unitary matrix modulation sections.

9. A receiver comprising:

a receiving section;

a serial-to-parallel conversion section;

a Fourier transform section;

an inverse split section;

a plurality of unitary matrix demodulation sections;

a parallel-to-serial conversion section; and

a decoding section,

wherein the receiving section receives a transmitted transmission signal and outputs the signal as a received signal;

wherein the serial-to-parallel conversion section converts the output received signal from serial to parallel, and outputs m x n ($m \geqq 2$, $n \geqq 1$) intermediate signals;

wherein the Fourier transform section Fourier transforms the output m x n intermediate signals, and outputs obtained m x n Fourier transformed signals;

wherein the inverse split section supplies the output m x n Fourier transformed signals to each of the unitary matrix demodulation sections by n without overlaps;

wherein each of the plurality of unitary matrix demodulation sections demodulates, from matrixes of m rows and m columns where each of the supplied m Fourier transformed signals is a diagonal element and elements excepting the diagonal elements are zero, the signals associated with the unitary matrixes of m rows and m columns where elements excepting diagonal elements are zero, and outputs the signals as demodulated signals;

wherein the parallel-to-serial conversion section converts the plurality of modulated signals from parallel to serial, and outputs the signal as a transmitted signal;

wherein the decoding section low-density-parity-codes the output serialized signal, and outputs the signal as a transmitted signal; and

wherein any of frequency differences between the channels, each from which the Fourier transformed signal given to each of the plurality of unitary matrix modulation sections is output, is a predetermined coherent bandwidth or more, among the channels of the Fourier transform section.

10. The receiver according to claim 9, wherein each of the plurality of unitary matrix demodulation sections compares each of predetermined plurality of unitary matrixes, which are unitary matrixes of m rows and m columns where elements excepting the diagonal elements are zero, with each of the matrixes of m rows and m columns where each of the supplied m Fourier transformed signals is a diagonal element and elements excepting the diagonal elements are zero, selects a matrix having a minimum Euclidean distance among from

the predetermined plurality of unitary matrixes, and sets the selected matrix as a demodulation result.

11. The receiver according to claim 10, wherein the diagonal elements ($0 \leqq i < n, 0 \leqq j < m$) of j-th row and j-th column of a matrix compared by an ith unitary matrix demodulation are output from a $j \times m+i$-th output channel of the inverse Fourier transform section, among the plurality of unitary matrix demodulation sections.

12. A program causing a computer to function a coding section, a serial-to-parallel conversion section, a plurality of unitary matrix modulation sections, a split section, an inverse Fourier transform section, a parallel-to-serial conversion section, and a transmitting section,

the program causes the computer to function in such a way that:

the coding section receives an input of a transmitting signal and low-density-parity-codes the received signal, and outputs the coded signal;

the serial-to-parallel conversion section receives an input of the output coded signal and converts the signal from serial to parallel, and outputs m x n ($m \geqq 2, n \geqq 1$) intermediate signals;

each of the plurality of unitary matrix modulation sections modulates the output any m of intermediate signals of the output m x n ($m \geqq 2, n \geqq 1$) intermediate signals without overlaps to a unitary matrix of m rows and m columns where elements excepting diagonal elements are zero, and outputs an obtained matrix;

the split section supplies each of the diagonal elements of the output matrix to each input channel of the inverse Fourier transform section as an input signal;

the inverse Fourier transform section inversely Fourier transforms the input signals supplied to the input channels, and outputs obtained m inversely Fourier transformed signals;

the parallel-to-serial conversion section converts the output m inversely Fourier transformed signals from parallel to serial, and outputs one transmission signal;

the transmitting section transmits the output transmission signal; and

any of frequency differences between the channels to which the diagonal elements of the matrix are given from the plurality of unitary matrix modulation sections is a predetermined coherent bandwidth or more, among the channels of the inverse Fourier transform section.

13. The program according to claim 12, wherein the program causes the computer to function in such a way that the diagonal elements ($0 \leqq i < n$, $0 \leqq j < m$) of j-th row and j-th column of a matrix output from an ith unitary matrix modulation are given to a $j \times m+i$-th input channel of the inverse Fourier transform section, among the plurality of unitary matrix modulation sections.

14. A program causing a computer to function a receiving section, a serial-to-parallel conversion section, a Fourier transform section, an inverse split section, a plurality of unitary matrix demodulation sections, a parallel-to-serial conversion section, and a decoding section,

the program causes the computer to function in such a way that:

the receiving section receives a transmitted transmission signal and outputs the signal as a received signal;

the serial-to-parallel conversion section converts the output received signal from serial to parallel, and outputs m x n ($m \geqq 2$, $n \geqq 1$) intermediate signals;

the Fourier transform section Fourier transforms the output m x n intermediate signals, and outputs obtained m x n Fourier transformed signals;

the inverse split section supplies the output m x n Fourier transformed signals to each of the unitary matrix demodulation sections by n without overlaps;

each of the plurality of unitary matrix demodulation sections demodulates, from matrixes of m rows and m columns where each of the supplied m Fourier transformed signals is a diagonal element and elements excepting the diagonal elements are zero, the signals associated with the unitary matrixes of m rows and m columns where elements excepting diagonal elements are zero, and outputs the signals as demodulated signals;

the parallel-to-serial conversion section converts the plurality of modulated signals from parallel to serial, and outputs the signal as a transmitted signal;

the decoding section low-density-parity-codes the output serialized signal, and outputs the signal as a transmitted signal; and

any of frequency differences between the channels, each from which the Fourier transformed signal given to each of the plurality of unitary matrix modulation sections is output, is a predetermined coherent bandwidth or more, among the channels of the Fourier transform section.

15. The program according to claim 14, wherein the program causes the computer to function in such a way that each of the plurality of unitary matrix demodulation sections compares each of predetermined plurality of unitary matrixes, which are unitary matrixes of m rows and m columns where elements excepting the diagonal elements are zero, with each of the matrixes of m rows and m columns where each of the supplied m Fourier transformed signals is a diagonal element and elements excepting the diagonal elements are zero, selects a matrix having a minimum Euclidean distance among from the predetermined plurality of unitary matrixes, and sets the selected matrix as a demodulation result.

16. The program according to claim 15, wherein the program causes the computer to function in such a way that the diagonal elements ($0 \leqq i < n$, $0 \leqq j < m$) of j-th row and j-th column of a matrix compared by an ith unitary matrix demodulation are output from a $j \times m+i$-th output channel of the inverse Fourier transform section, among the plurality of unitary matrix demodulation sections.